PMU Emulator and Animation for Synchrophasor Education (SynchroEd)

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SGDRIL
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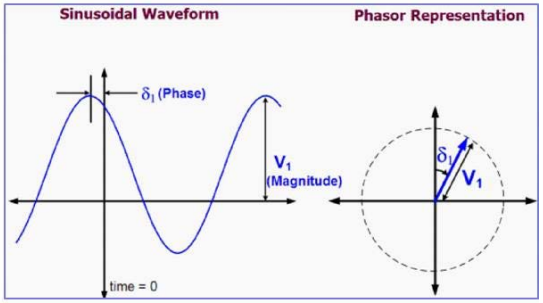
What it is?

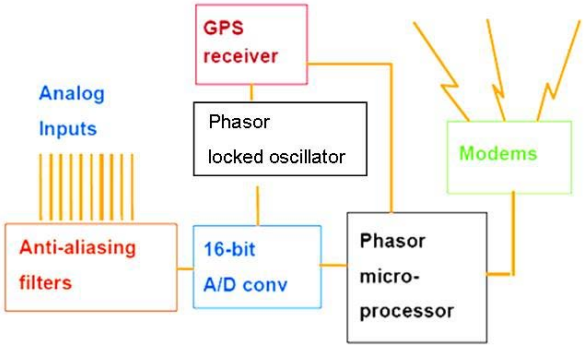
- Educational and training module for basic synchrophasor concepts.
- Detail codes for synchrophasor estimation, filtering embedded in animation
- Developed with support of DOE funding



- Students can learn concept of PMU and fundamental functions; ADC, GPS signal, Phasor estimator
- C++ and MATLAB code

Why to use?

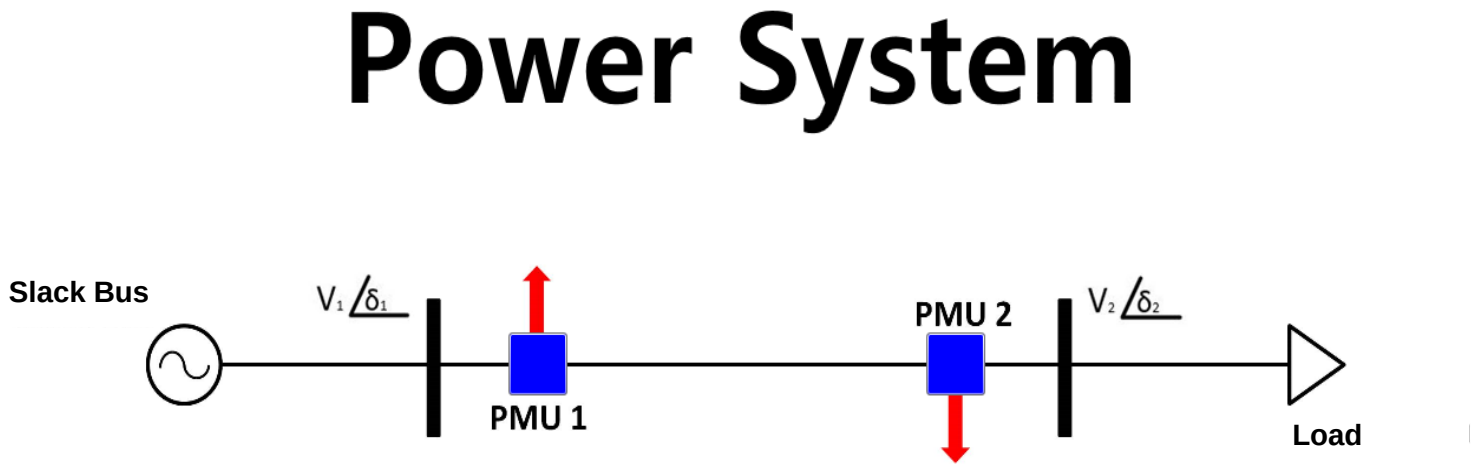
- Device and system context using animation
- Detail device level information using actual PMU blocks
- Basic synchrophasor concepts and how phasor changes with system dynamic conditions
- How noise, filtering, estimation impact PMU output
- Easy to integrate into existing training or education modules



Main Window of SynchroEd

Simple two bus system to determine voltage and current phasor
In the context of the power system

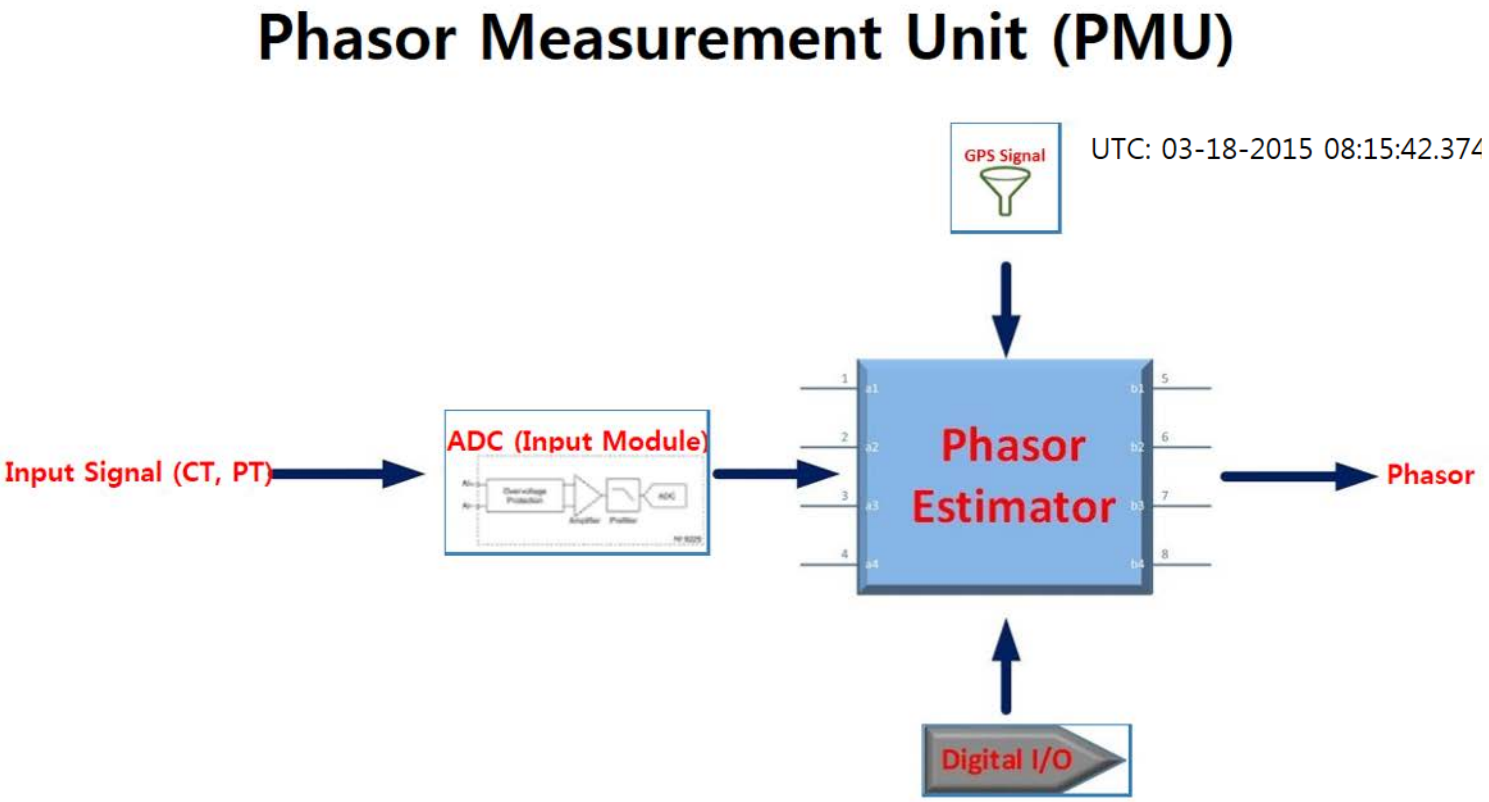
To start PMU animation software, click either PMU1 or PMU2



SynchroEd: PMU architecture

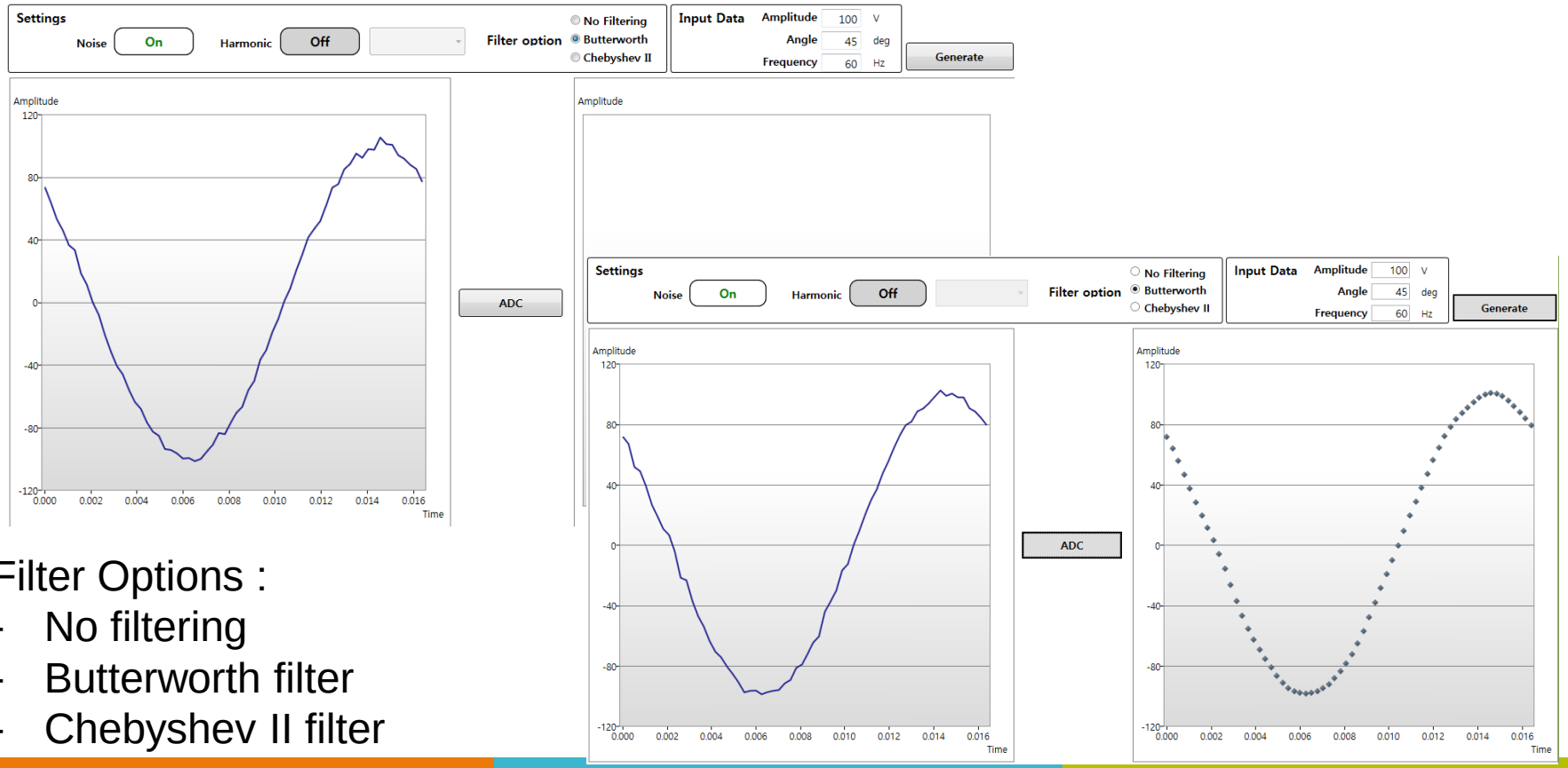
There are four functions;
- GPS Signal, ADC Module, Digital I/O Module, and Phasor Estimator

UTC or GPS signal has been used for time stamp.
By clicking GPS Signal, UTC time is shown next to GPS Signal function.



SynchroEd: ADC Module

ADC with filter can reduce noise and harmonics.

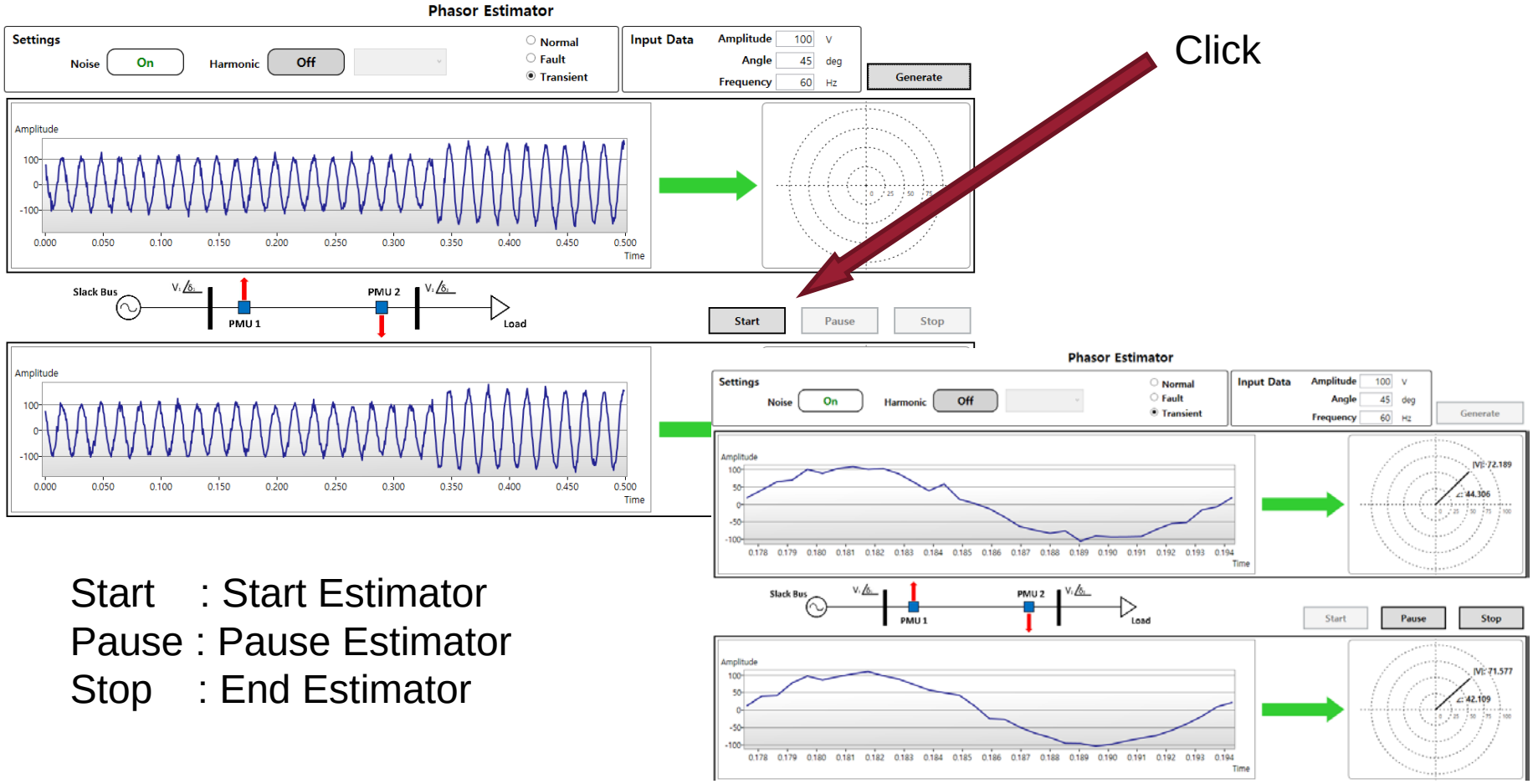


Filter Options :

- No filtering
- Butterworth filter
- Chebyshev II filter

SynchroEd: Phasor Estimator module

PMU can estimate voltage and current phasor from PT and CT signals
First, generating input signal with/without noise, harmonics, and transient condition.
Then, PMU can estimate phasor by clicking on start button.



Start : Start Estimator
Pause : Pause Estimator
Stop : End Estimator

Demo

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